Solution Assignment

1. Which of the following should be done in order to prepare $0.40\,M\ NaCl$ starting with $100\,ml$ of $0.30\,M\ NaCl$ (mol. wt. of $NaCl = 58.5$)
   (a) Add $0.585\,g\ NaCl$ (b) Add $20\,ml$ water (c) Add $0.010\,ml\ NaCl$ (d) Evaporate $10\,ml$ water
2. What is the molarity of a solution of *HCl* which contains 49% by weight of solute and whose specific gravity is 1.41
   (a) 15.25 (b) 16.75 (c) 18.92 (d) 20.08
3. Which statement is true for solution of $0.020\,M\ H_2SO_4$
   (a) 2 litre of the solution contains 0.020 *mole* of SO_4^{2-} (b) 2 litre of the solution contains 0.080 *mole* of H_3O^+
   (c) 1 litre of the solution contains 0.020 *mole* H_3O^+ (d) None of these
4. A solution of $CaCl_2$ is 0.5 *mol/litre,* then the moles of chloride ions in 500 *ml*, will be
   (a) 0.25 (b) 0.50 (c) 0.75 (d) 1.00
5. If $25\,ml$ of $0.25\,M\ NaCl$ solution is diluted with water to a volume of $500\,ml$ the new concentration of the solution is
   (a) $0.167\,M$ (b) $0.0125\,M$ (c) $0.833\,M$ (d) 0.0167
6. 3.0 molal $NaOH$ solution has density of $1.110\ g/ml$. The molarity of this solution is
   (a) 3.0504 (b) 3.64 (c) 3.05 (d) 2.9732
7. The formula weight of H_2SO_4 is 98. The weight of the acid in $400\,ml$ of $0.1\,M$ solution is
   (a) $2.45\,g$ (b) $3.92\,g$ (c) $4.90\,g$ (d) $9.8\,g$
8. $25\,ml$ of $3.0\,M\ HNO_3$ are mixed with $75\,ml$ of $4.0\,M\ HNO_3$. If the volumes are additive, the molarity of the final mixture would be
   (a) $3.25\,M$ (b) $4.0\,M$ (c) $3.75\,M$ (d) $3.50\,M$
9. How many grams of *HCl* will be present in 150 *ml* of its 0.52 *M* solution
   (a) 2.820 *g* (b) $5.70\ gm$ (c) $8.50\ gm$ (d) $3.65\ gm$
10. How many litres of CO_2 at STP will be formed when $100\,ml$ of $0.1\,M\ H_2SO_4$ reacts with excess of Na_2CO_3
    (a) 22.4 (b) 2.24 (c) 0.224 (d) 5.6
11. 10.6 *g* of a substance of molecular weight 106 was dissolved in 100 *ml*; 10 *ml* of this solution was pipetted out into a 1000 *ml* flask and made upto the mark with distilled water. The molarity of the resulting solution is
    (a) 1.0 *M* (b) $10^{-2}\ M$ (c) $10^{-3}\ M$ (d) $10^{-4}\ M$
12. A certain aqueous solution of $FeCl_3$ (formula mass =162) has a density of $1.1\ g/ml$ and contains 20.0% $FeCl_3$. Molar concentration of this solution is
    (a) 0.028 (b) 0.163 (c) 1.27 (d) 1.47
13. If 0.50 *mole* of $CaCl_2$ is mixed with 0.20 *mol* of Na_3PO_4, the maximum number of moles of $Ca_3(PO_4)_2$ which can be formed, is
    (a) 0.70 (b) 0.50 (c) 0.20 (d) 0.10
14. 25 *ml* of a solution of barium hydroxide on titration with a 0.1 molar solution of hydrochloric acid gave a litre value of 35 *ml*. The molarity of barium hydroxide solution was
    (a) 0.07 (b) 0.14 (c) 0.28 (d) 0.35
15. 2.5 *litre* of 1*M NaOH* solution are mixed with another 3 litre of 0.5 *M NaOH* solution. Then the molarity of the resulting solution is
    (a) 0.80 *M* (b) 1.0 *M* (c) 0.73 *M* (d) 0.50 *M*
16. The molar solution of sulphuric acid is equal to
    (a) *N* solution (b) 2*N* solution (c) *N*/2 solution (d) 3*N* solution
17. $20\,ml$ of HCl solution requires $19.85\,ml$ of $0.01\,M\ NaOH$ solution for complete neutralization. The molarity of HCl solution is
    (a) 0.0099 (b) 0.099 (c) 0.99 (d) 9.9
18. The amount of anhydrous Na_2CO_3 present in $250\,ml$ of $0.25\,M$ solution is
    (a) $6.225\,g$ (b) $66.25\,g$ (c) $6.0\,g$ (d) $6.625\,g$
19. How many grams of CH_3OH would to be added to water to prepare 150 *ml* of solution that is $2.0\,M\ CH_3OH$
    (a) 9.6 (b) 2.4 (c) 9.6×10^3 (d) 4.3×10^2
20. The number of moles of oxygen in one litre of air containing 21% oxygen by volume in standard conditions, is

(a) 0.186 mole (b) 0.21 mole (c) 2.10 mole (d) 0.093 mole

21. The mineral atacamite (A) is $[CuCl_2 . xCu(OH)_2]$.$45.05\ ml$ of 0.5089 *M HCl* were required to react completely with 1.6320 *g* of *A*. Hence *x* is (*mol. wt. A* = 427)
(a) 2 (b) 3 (c) 4 (d) 1

22. What weight of ferrous ammonium sulphate is needed to prepare $100 ml$ of 0.1 normal solution (mol. wt. 392)
(a) $39.2\ g$ (b) $3.92\ g$ (c) $1.96\ g$ (d) $19.6 g$

23. $10 ml$ of conc. H_2SO_4 (18 molar) is diluted to 1 litre. The approximate strength of dilute acid could be
(a) 0.18 *N* (b) 0.09 *N* (c) 0.36*N* (d) 1800 *N*

24. How many grams of a dibasic acid (Mol. wt=200) should be present in 100 *ml* of its aqueous solution to give decinormal strength
(a) 1 g (b) 2 g (c) 10 g (d) 20 g

25. Hydrochloric acid solution *A* and *B* have concentration of 0.5 *N* and 0.1 *N* respectively. The volumes of solutions *A* and *B* required to make 2 litres of 0.2 *N HCl* are
(a) 0.5 *l* of *A* + 1.5 *l* of *B* (b) 1.5 *l* of *A* + 0.5 *l* of *B* (c) 1.0 *l* of *A* + 1.0 *l* of *B* (d) 0.75 *l* of *A* + 1.25 *l* of *B*

26. What weight of hydrated oxalic acid should be added for complete neutralisaion of $100 ml$ of $0.2 N - NaOH$ solution
(a) 0.45 *g* (b) 0.90 *g* (c) 1.08 *g* (d) 1.26 *g*

27. Volume of water needed to mix with 10 *ml* 10 *N* HNO_3 to get 0.1*N* HNO_3
(a) 1000 *ml* (b) 990 *ml* (c) 1010 *ml* (d) 10 *ml*

28. The concentration of an aqueous solution of $0.01 M\ CH_3OH$ solution is very nearly equal to which of the following
(a) 0.01% CH_3OH (b) 0.01 $m\ CH_3OH$ (c) $X\ CH_3OH = 0.01$ (d) 0.99 $M\ H_2O$
(e) 0.01 $N\ CH_3OH$

29. The weight of pure *NaOH* required to prepare $250\ cm^3$ of 0.1 *N* solution is
(a) 4 *g* (b) 1 *g* (c) 2 *g* (d) 10 *g*

30. The normality of $2.3 M\ H_2SO_4$ solution is
(a) 2.3 *N* (b) 4.6 *N* (c) 0.46 *N* (d) 0.23 *N*

31. Formation of a solution from two components can be considered as
(i) Pure solvent $\rightarrow$ separated solvent molecules ΔH_1
(ii) Pure solute $\rightarrow$ separated solute molecules ΔH_2
(iii) Separated solvent and solute molecules $\rightarrow$ solution ΔH_3
Solution so formed will be ideal if
(a) $\Delta H_{soln} = \Delta H_3 - \Delta H_1 - \Delta H_2$ (b) $\Delta H_{soln} = \Delta H_1 + \Delta H_2 + \Delta H_3$
(c) $\Delta H_{soln} = \Delta H_1 + \Delta H_2 - \Delta H_3$ (d) $\Delta H_{soln} = \Delta H_1 - \Delta H_2 - \Delta H_3$

32. A solution is obtained by dissolving 12 *g* of urea (*mol. wt.* 60) in litre of water. Another solution is obtained by dissolving 68.4 *g* of cane sugar (*mol. wt.* 342) in a litre of water at are the same temperature. The lowering of vapour pressure in the first solution is
(a) Same as that of 2nd solution (b)Nearly one-fifth of the 2nd solution
(c) Double that of 2nd solution (d) Nearly five times that of 2nd solution

33. A solution containing 30 *g* of non-volatile solute in exactly 90 *g* water has a vapour pressure of 21.185 *mm Hg* at $25^o C$. Further 18 *g* of water is then added to the solution. The resulting solution has a vapour pressure of $22.15\ mm\ Hg$ at $25^o C$, Calcualte the molecular weight of the solute
(a) 74.2 (b) 75.6 (c) 70.3 (d) 78.7

34. 60 *gm* of urea (*mol. wt.* 60) was dissolved in 9.9 *mols* of water. If the vapour pressure of pure water is *Po*, the vapour of solutions is
(a) $0.10\ P_0$ (b) $1.10\ P_0$ (c) 0.90 P_0 (d) 0.99 P_0

35. The relative lowering of vapour pressure produced by dissolving $71.5\ g$ of a substance in $1000\ g$ of water is 0.00713. The molecular weight of the substance will be
(a) 18.0 (b) 342 (c) 60 (d) 180

36. Dry air was passed successively through a solution of $5\ g$ of a solute in $80\ g$ of water and then through pure water. the loss in weight of solution was $2.50\ g$ and that of pure solvent $0.04\ g$. What is the molecular weight of the solute
(a) 71.43 (b) 7.143 (c) 714.3 (d) 80

37. The vapour pressure of a solution of 5 *g* of a non-electrolyte in 100 *g* of water at a particular temperature is $2985\ N m^{-2}$. The vapour pressure of pure water at that temperature is $3000\ N m^{-2}$. The molecular weight of the solute is

(a) 60 (b) 120 (c) 180 (d) 380

38. Which of the following solution in water possesses the lowest vapour pressure

(a) $0.1\ M\ NaCl$ (b) $0.1\ N\ BaCl_2$ (c) $0.1\ M\ KCl$ (d) None of these

39. The vapour pressure of benzene at a certain temperature is $640\ mm$ of Hg. A non-volatile and non-electrolyte solid weighing $2.175\ g$ is added to $39.08\ g$ of benzene. The vapour pressure of the solution is $600\ mm$ of Hg. What is the molecular weight of solid substance

(a) 49.50 (b) 59.6 (c) 69.5 (d) 79.8

40. The vapour pressure of a solvent decreased by $10\ mm$ of mercury, when a non-volatile solute was added to the solvent. The mole fraction of the solute in the solution is 0.2. What should be the mole fraction of the solvent, if decrease in the vapour pressure is to be $20\ mm$ of mercury

(a) 0.8 (b) 0.6 (c) 0.4 (d) 0.2

41. Benzene acid undergoes dimerisation in benzene solution, the Vant Hoff factor '*i*' is related to degree of association 'x' of the acid as

(a) $i = (1 - x)$ (b) $i = (1 + x)$ (c) $i = (1 - x/2)$ (d) $i = (1 + x/2)$

42. The digree of dissociation 'α', of a weak electrolyte is

Where *N* is the number of ions given by 1 mol of the elecrolyte

(a) $\frac{i-1}{N+1}$ (b) $\frac{i-1}{N-1}$ (c) $\frac{N-1}{i-1}$ (d) $\frac{N+1}{t-1}$

43. Arrange the following aqueous solutions in the order of their increasing boiling points

(i) $10^{-4}\ M\ NaCl$ (ii) $10^{-4}\ M$ urea (iii) $10^{-3}\ M\ MgCl_2$ (iv) $10^{-2}\ M\ NaCl$

(a) (i) < (ii) < (iv) < (iii) (b) (ii) < (i) = (iii) < (iv) (c) (i) < (ii) < (iii) < (iv) (d) (iv) < (iii) < (i) = (ii)

44. 10 *g* of solute with molecular mass 100 $g\ mol^{-1}$ is dissolved in 100 *g* of solvent to show 0.3° elevation in boiling point. The value of molal ebullioscopic constant will be

(a) 10 (b) 3 (c) 0.3 (d) Unpredictable

45. The boiling point of 0.1 molal $K_4[Fe(CN)_6]$ solution will be (given K_b for water $= 0.52°C\ kg\ mol^{-1}$)

(a) 100.52°*C* (b) 100.104°*C* (c) 100.26°*C* (d) 102.6°*C*

46. If the elevation in boiling point of a solution of 10 *gm* of solute (*mol. wt.* =100) in 100 *g* of water is ΔT_b, the ebullioscopic constant of water is

(a) 10 (b) $10\ \Delta T_b$ (c) ΔT_b (d) $\Delta T_b / 10$

47. The freezing point of a solution containing 4.8 *g* of a compound in 60 *g* of benzene is 4.48. What is the molar mass of the compound ($K_f = 5.1\ K m^{-1}$, freezing point benzene $= 5.5^o C$)

(a) 100 (b) 200 (c) 300 (d) 400

48. An aqueous solution freezes at $-0.186^o C$ ($k_f = 1.86^o; k_b = 0.512^o$). What is the elevation in boiling point

(a) 0.186 (b) 0.512 (c) $\frac{0.512}{1.86}$ (d) 0.0512

49. Molal depression constant for water is $1.86^o C$. The freezing point of a 0.05 molal solution of a non-electrolyte in water is

(a) $-1.86^o C$ (b) $-0.93^o C$ (c) $-0.093^o C$ (d) $0.93^o C$

50. The freezing point of a $0.01\ M$ aqueous glucose solution at 1 atmosphere is $-0.18^o C$. To it, an addition of equal volume of $0.002\ M$ glucose solution will produce a solution with freezing point of nearly

(a) $-0.036^o C$ (b) $-0.108^o C$ (c) $-0.216^o C$ (d) $-0.422^o C$